

311/01

BIOLOGY (MODULAR)

MODULE BI1

A.M. MONDAY, 27 May 2002

(1 hour 30 minutes)

For Examiner's Use Only

Total Marks	
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Centre Number

Candidate's Name (in full)

Candidate's Examination Number

INSTRUCTIONS TO CANDIDATES

Write your centre number, name and candidate number in the spaces provided above.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

1. (a) Name each of the following.

(i) The structural polysaccharide found in plant cell walls. [1]

.....

(ii) The term applied to all cells in which the cytoplasm contains membrane bound organelles. [1]

.....

(iii) A circular piece of DNA, from a bacterial cell, used in genetic engineering. [1]

.....

(iv) The enzyme used in a biosensor for detecting glucose in blood. [1]

.....

(b) Give **one difference** between each of the following:

(i) phagocytosis and pinocytosis, [1]

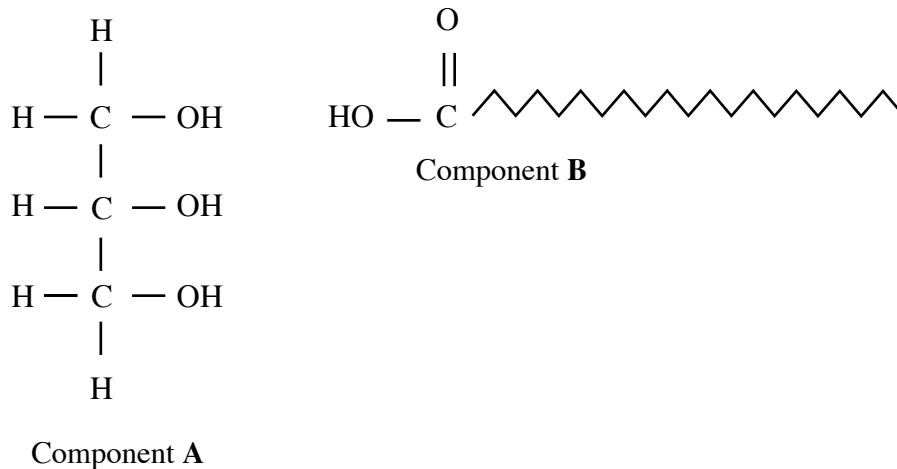
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(ii) a turgid plant cell and a plasmolysed plant cell. [1]

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(Total 6 marks)

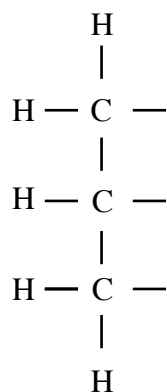
2. The diagram shows the components of one type of lipid molecule.



(a) Name the components: [2]

A B

- (b) Draw a ring around the atoms that would be removed if a bond were formed between the components. [1]
- (c) What type of chemical reaction would be involved in the formation of such a bond? [1]
-
- (d) Complete the following diagram to show the structural formula of a compound in which three molecules of component **B** become bound to one molecule of component **A**. [2]



- (e) (i) Name the type of lipid formed in this way. [1]
-
- (ii) State one function which these compounds perform in animal **cells**. [1]
-
- (f) Cooking food in olive oil is believed to be healthier than using animal fat.
- (i) What type of disease is believed to be affected? [1]
-
- (ii) How does component **B** of olive oil differ from component **B** in animal fat? [1]
-
- (iii) Give **one other** difference between fats and oils. [1]
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(Total 11 marks)

Turn over.

3. Enzymes are often described as biological catalysts.

(a) What is a catalyst? [1]

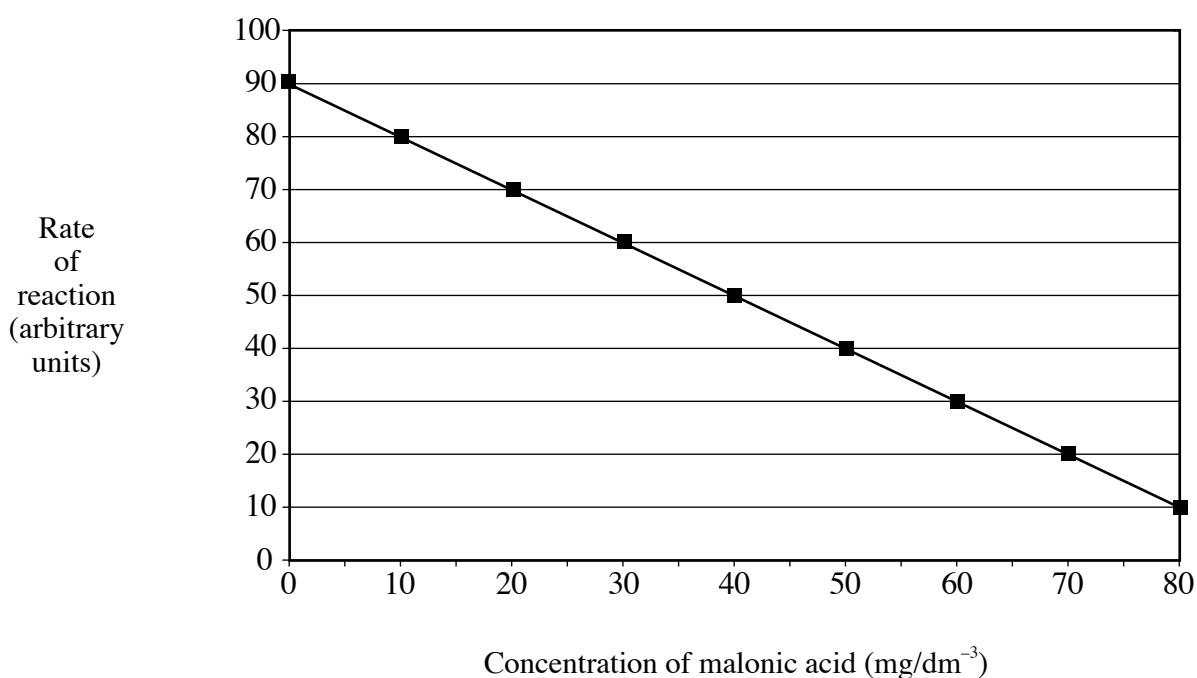
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(b) What property of chemical reactions is lowered by enzymes, enabling them to proceed rapidly? [1]

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Malonic acid is known to be an inhibitor of the enzyme *succinic acid dehydrogenase*. A group of students carried out an experiment in which they mixed malonic and succinic acids with an extract prepared from living cells.

Their results are shown in the following graph.



(c) Describe the effect that increasing the concentration of malonic acid had on the rate of the reaction. [1]

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(d) Name the type of inhibition that these results demonstrate. [1]

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- (e) Using the 'lock and key' hypothesis, explain the effect you described in part (c). [3]

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- (f) How could the students have ensured that the pH of their reaction mixtures did not change during the course of their experiment? [1]

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- (g) Describe a suitable control that the students might have set up to show that an **enzyme** in the cell extract was being affected by malonic acid. [2]

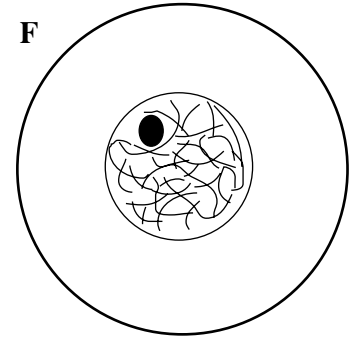
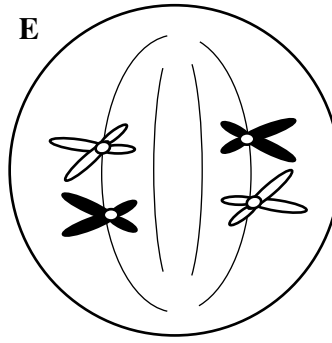
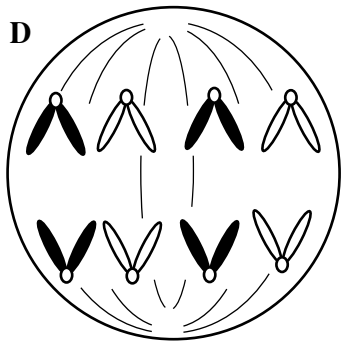
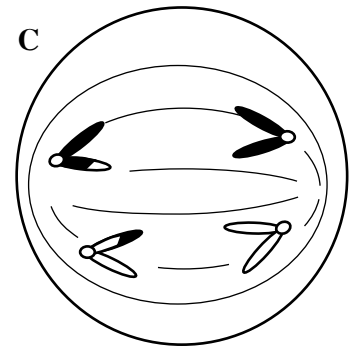
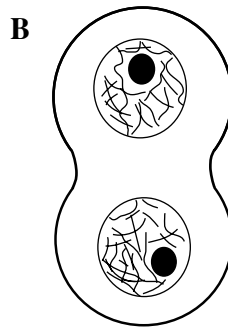
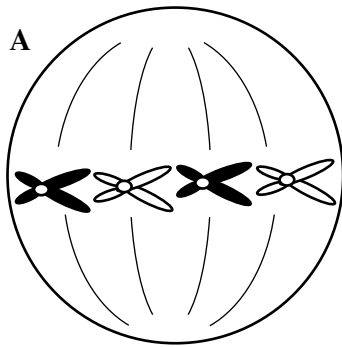
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(Total 10 marks)

4. The drawings show stages in cell division of an organism.



(a) Write a letter **A** to **F** to identify the diagram described by each of the phrases below. (Each letter may be used once, more than once or not at all.) [6]

- (i) metaphase of mitosis
- (ii) anaphase II of meiosis
- (iii) cytokinesis
- (iv) DNA replicates
- (v) homologous pairs of chromosomes arranged across equator
- (vi) chromosomes show that crossing over has occurred

- (b) (i) What is the diploid number for this organism? [1]
- (ii) How many chromosomes would a gamete of this organism contain? [1]

(c) Give **three** ways in which meiosis contributes to genetic variation.

[3]

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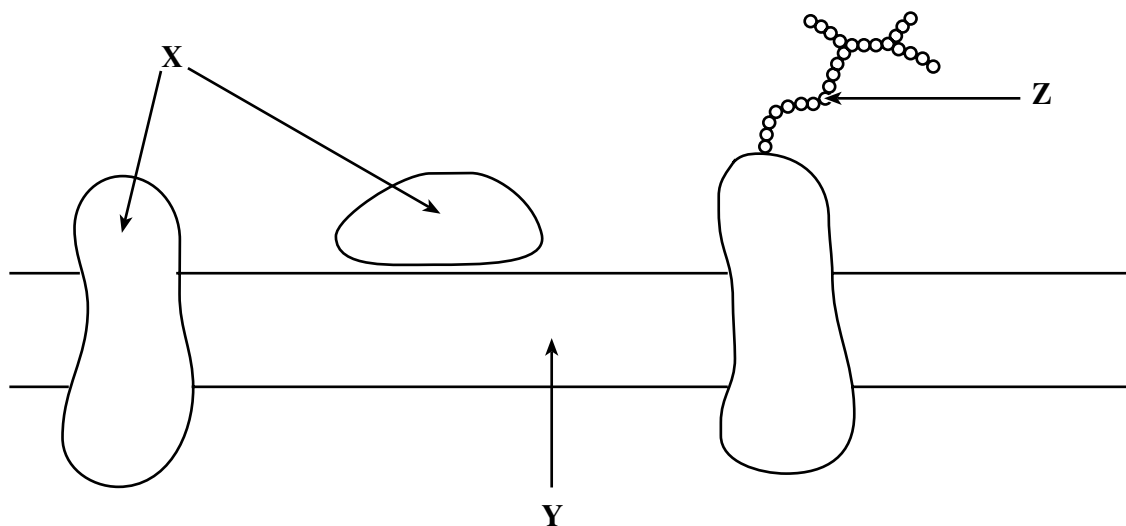
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(Total 11 marks)

5. The most widely accepted model of the structure of biological membranes is known as the fluid-mosaic model.



- (a) Name the class of biologically important chemicals from which each of the parts labelled **X**, **Y** and **Z** are made. [3]

X

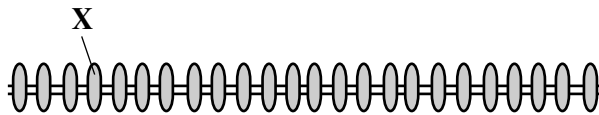
Y

Z

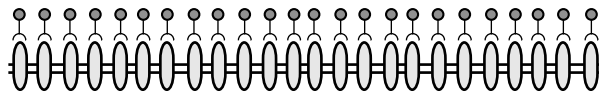
- (b) Make a labelled diagram to show the arrangement of molecules in part **Y**. [3]

- (c) The model is described as fluid because the component molecules are free to move about. Evidence for this includes experiments like the one shown below, in which component molecules X are labelled with a dye.

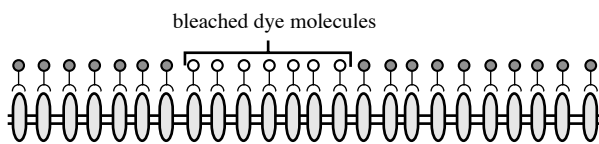
A - the membrane model



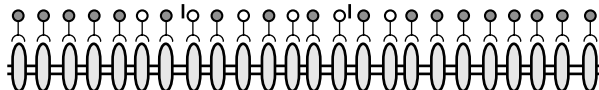
A molecule of dye was attached to each molecule X



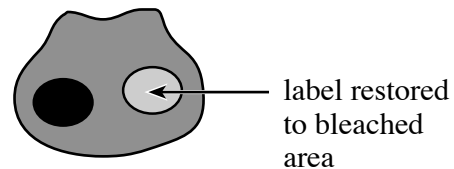
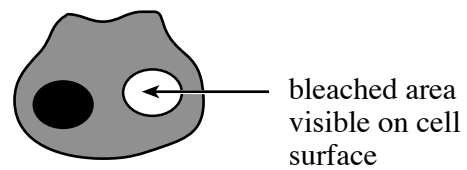
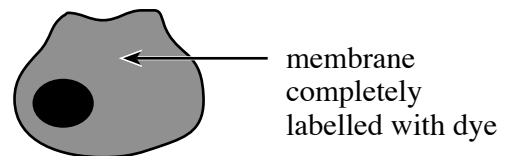
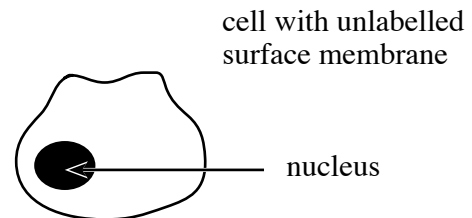
A patch of dye was bleached with a laser beam.



After a short time the patch became coloured again



B - appearance of cell



Using the information above, suggest how the colour was restored to the bleached area. [2]

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Turn over.

(d) Give **three** functions of the cell surface membrane.

[3]

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(Total 11 marks)

6. The synthesis of a polypeptide chain involves transcription and translation.

(a) Distinguish between these two processes by placing ticks in the appropriate boxes (you may tick either or both boxes): [5]

	<i>transcription</i>	<i>translation</i>
Occurs in the nucleus		
Involves messenger RNA.		
Needs RNA polymerase		
Involves formation of peptide bonds		
Occurs in ribosomes		

(b) The following letters represent the base sequence of a piece of messenger RNA.

AUG/CUU/ACU/GGU/CAA

(i) Write out the base sequence of the strand of DNA from which it was formed. [2]

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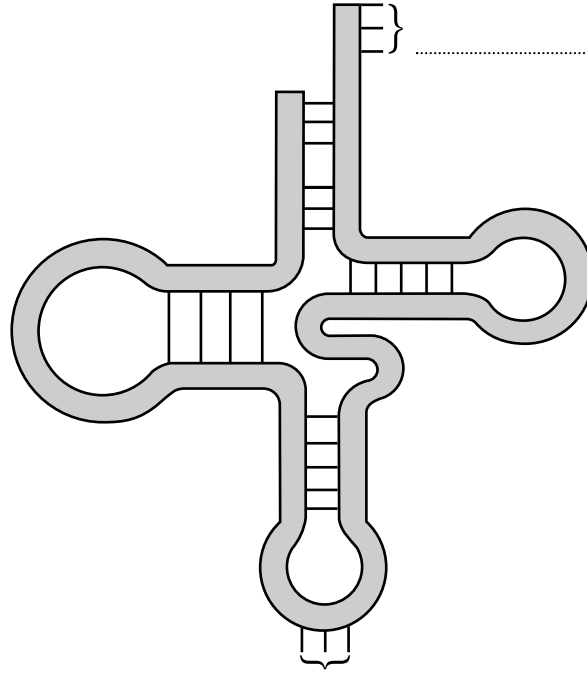
(ii) Use the table to write out the sequence of amino acids that would be formed.

Codon	amino acid (abbreviation)	codon	amino acid (abbreviation)	codon	amino acid (abbreviation)
CUU	leu	AUU	iso	GCU	ala
CCU	pro	ACU	thr	GAA	gta
CAA	glu	AAU	asp	GGU	gly
CGU	arg	AUG	met	UGG	try

Amino acid sequence [2]

(c) Label the drawing of a transfer RNA molecule.

[2]



(Total 11 marks)

Turn over.

EITHER	(a)	Distinguish between primary, secondary, tertiary and quaternary structure of proteins.	[10]
OR	(b)	With the aid of labelled drawings, compare a mitochondrion and a chloroplast.	[10]

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(Total 10 marks)